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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/668,555

09/22/2003

Ray-Hua Horng

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01/05/2006

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EXAMINER

DOTY, HEATHER ANNE

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 01/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

EF

Office Action Summary	Application No.		Applicant(s)	
	10/668,555		HORNG ET AL.	
	Examiner		Art Unit	
	Heather A. Doty		2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 18-25 is/are pending in the application.
- 4a) Of the above claim(s) 1-12, 19 and 25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 13-15, 18 and 20-24 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claims Listing

Since claim 13 was amended on 2 February 2005, it is not appropriate to label claim 13 "(original)." The status should be changed to "(previously presented)."

Furthermore, it is not clear if claims 1-12 are canceled or withdrawn. 37 CFC 1.121 indicates that:

Amendments to a claim must be made by rewriting the entire claim with all changes (e.g., additions and deletions) as indicated in this subsection, except when the claim is being canceled. Each amendment document that includes a change to an existing claim, cancellation of an existing claim or addition of a new claim, must include a complete listing of all claims ever presented, including the text of all pending and withdrawn claims, in the application. The claim listing, including the text of the claims, in the amendment document will serve to replace all prior versions of the claims, in the application. In the claim listing, the status of every claim must be indicated after its claim number by using one of the following identifiers in a parenthetical expression: (Original), (Currently amended), (Canceled), (Withdrawn), (Previously presented), (New), and (Not entered).

Since the text of claims 1-12 is absent, it is implied that these claims are canceled and not withdrawn, as indicated on the claims listing.

Election/Restrictions

In the response dated 10/31/2005, Applicant argues that there is no obvious difference between AlGaInP, GaAlInN, InGaAs, and ZnSSe when a suitable mirror is provided, so it is not appropriate to restrict among these species. Claims 21-23 are therefore no longer withdrawn. However, since Applicant admits that these materials are not distinct for the purposes of patentability, claims 21-23 are rejected below as obvious variants of claim 20.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. (US. 5,696,389) in view of Chen et al. (U.S. 6,468,824).

Regarding claim 13, Ishikawa et al. teaches a light emitting diode with a mirror comprising an LED epitaxial structure (Fig. 23; column 20, line 20 – column 21, line 43) sequentially comprising a second cladding layer (307), an active layer (308), a first cladding layer (309), a window (310 allows passage of red and green light; column 21, lines 15-16), and a metal contact layer (319), wherein said second cladding layer is partially exposed; a first electrode on said metal contact layer (layer 319 is Au/Zn, the metal contact layer and electrode; column 20, lines 61-62), a second electrode formed on said exposed second cladding layer (317); and a mirror formed beneath said LED epitaxial structure (306).

Ishikawa et al. does not teach a permanent metal substrate plated beneath said mirror.

Chen et al. teaches a method for forming an LED with a copper substrate plated beneath a mirror to provide a substrate with high thermal and electrical conductivity, thereby increasing the reliability and duration time of the LED (column 2, line 55 – column 3, line 4; column 4, line 64 – column 5, line 9).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the teachings of Ishikawa et al. and Chen et al. to fabricate an LED as taught by Ishikawa et al. and provide the LED with a copper plated substrate, as taught by Chen et al. The motivation for doing so at the time of the invention would have been to improve the device's reliability and duration time, as expressly taught by Chen et al.

Regarding claim 14, Ishikawa et al. and Chen et al. together teach the diode as claimed in claim 13. Ishikawa et al. further teaches that the LED epitaxial structure is made from $(\text{Al}_x\text{Ga}_{1-x})_y\text{In}_{1-y}\text{P}$, wherein $0 \leq x \leq 1$, $0 \leq y \leq 1$ (column 20, lines 24-43).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. (US. 5,696,389) in view of Chen et al. (U.S. 6,468,824) as applied to claim 13 above, and further in view of Jou et al. (U.S. 5,869,849).

Regarding claim 15, Ishikawa et al. and Chen et al. together teach the light emitting diode as claimed in claim 13. They do not teach forming a transparent conductive film between a first electrode and a metal contact layer.

Jou et al. teaches a light emitting diode with a transparent conductive film (ITO, **570** in Fig. 6e) formed between an electrode (**560b** in Fig. 6e) and a contact layer (**520** in Fig. 6e) to act as a current-spreading layer (column 4, lines 25-35).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to form an ITO layer, as taught by Jou et al., between the metal contact layer and electrode layer taught by Ishikawa et al. and Chen et al. together. The

motivation for doing so at the time of the invention would have been to provide a current-spreading layer, as expressly taught by Jou et al.

Claims 18 and 20-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishikawa et al. (US. 5,696,389) in view of Chen et al. (U.S. 6,468,824) as applied to claim 13 above, and further in view of Yang (U.S. 2003/0155579).

Regarding claims 18, 20, and 24, Ishikawa et al. and Chen et al. together teach the light emitting diode as claimed in claim 13, but they do not teach that the mirror is made from a composite of a metal with a low refractivity and an insulating layer with a high refractivity, and said insulating layer is adjacent to said LED epitaxial structure or that the mirror is made from a material selected from the group consisting of Ag, Au, Au/Zn, Au/Be, Au/Ge, Au/Ge/Ni and Zn, or mixtures thereof.

Yang teaches an LED structure made from $(Al_xGa_{1-x})_yIn_{1-y}P$, wherein $0 \leq x \leq 1$, $0 \leq y \leq 1$ (paragraph 0016), including a mirror made of a metal with a low refractivity (Al, Ag, or Au, layer **12** in Fig. 2; paragraph 0018) and an insulating layer with a high refractivity (SiO_2 , Al_2O_3 , layers **11** and **14** in Fig. 2; paragraphs 0017-0018), and said insulating layer is adjacent to the LED epitaxial layer. This combination of mirror materials provides a highly reflective surface (paragraph 0007) with a protection surface (paragraph 0017).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to fabricate the LED taught by Ishikawa et al. and Chen et al. together, and further fabricate the mirror structure from a composite of a metal with a low refractivity such as Al or Ag and an insulating layer with a high refractivity, with the

insulating layer adjacent the LED epitaxial structure, as taught by Yang. The motivation for doing so at the time of the invention would have been to provide a mirror with a highly reflective surface and a layer to protect it, as expressly taught by Yang.

Regarding claims 21-23, Applicant admits that there is no obvious difference between AlGaInP, GaAlInN, InGaAs, and ZnSSe when a suitable mirror is provided (paragraph 4 of response dated 10/31/2006). Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to substitute any of GaAlInN, InGaAs, or ZnSSe for the $(\text{Al}_x\text{Ga}_{1-x})_y\text{In}_{1-y}\text{P}$ taught by Yang.

Response to Arguments

Applicant's arguments filed 10/31/2005 have been fully considered but they are not persuasive.

Applicant argues on pages 5-6 that the LED structure taught by Chen et al. is different from that taught by Applicant, and that "yield product for Chen et al. could not be as satisfying as Applicant's." However, in the non-final rejection dated 7/29/2005, Chen et al. is relied upon only to teach the advantages of plating a permanent metal substrate beneath the mirror of an LED (see page 3, paragraphs 2-4). As regards independent claim 13, Ishikawa et al. is relied upon to teach the LED structure not including the permanent metal substrate.

In the last paragraph of page 6 Applicant further argues that Ishikawa et al. teaches "a p-type InGaP contact layer (311) which is made from a material different from Applicant's and arranged on a position different from Applicant's." However, the non-final rejection dated 7/29/2005 treats layer 319 as the metal contact layer with first

electrode, since it disclosed to be made of Au/Zn (column 20, line 60). Furthermore, the language of claim 13 does not preclude the inclusion of other, non-claimed layers such as, for example, layer **311** in Ishikawa et al.

Applicant additionally argues on page 6 that Ishikawa et al. teaches a disk-like n-side electrode (**125** in Figs. 6 and 7), and asserts that “alternatively a current block for uniformly disspreading current should be required in case of the p-side down structure,” a design complex as compared to Applicant’s structure. However, as noted above, Applicant’s claims do not preclude the inclusion of other, non-claimed layers. Furthermore, the rejection relies upon the twelfth embodiment (Fig. 23) of Ishikawa et al., which has a different structure from the second embodiment, depicted in Figs. 6 and 7.

Finally, Applicant argues on page 6 that “in Applicant’s LED apparatus, positions of the electrodes and materials of the active layer and the mirror are determined out of careful consideration for the plated substrate.” However, the cited prior art reads on Applicant’s LED apparatus, positions of the electrodes and materials of the active layer, as they are currently claimed. Applicant offers no further explanation for why a person having ordinary skill in the art would not arrive at the present invention by combining the teachings of Ishikawa et al. with those of Chen et al. and Jou et al. or Yang. Therefore, this argument is not persuasive.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 5:00.

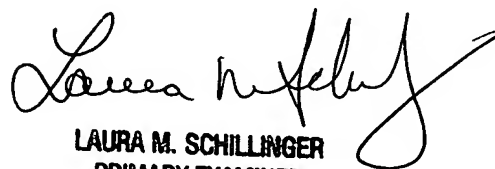
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

had



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PRIMARY EXAMINER